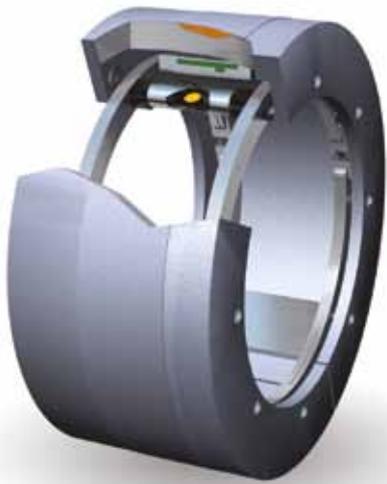


# VAF

INSTRUMENTS



## T-Sense

Optical Torque Measuring Systems

660

Product Bulletin

[WWW.VAF.NL](http://WWW.VAF.NL)

TO BE  
REALLY  
SURE

# Introduction

The use of a T-Sense torque measuring system means efficiency improvement, overload protection and prevention of breakdown costs. For example in the shipping industry its application has lead to savings up to 5% on fuel costs. The system is based on extremely accurate optical sensor technology and can be mounted around shafts in power transmission systems.

## Why a torque measuring system?

A torque meter provides you with precise information on engine performance related to consumed energy. By giving instantaneous read-out of torque, speed and power, the effects of operational changes are monitored. Because these effects are measured, you can use your engine-driven installation in its most efficient way. This will considerably reduce your fuel costs, one of the primary cost drivers.

## Where is the T-Sense torque measuring system used?

T-Sense torque measuring systems are used for engine-driven installations in all kinds of power and propulsion plants. For example continuous power output measurement of ships propulsion, continuous power consumption measurement, continuous level check for torque, speed and power and direct visual control of changes in engine settings, trim and draught.

## Possible system extensions

A full range of T-Sense torque measuring systems is available. The standard output of the torque measuring system consists of a torque, shaft speed and power signal. The system can be extended with energy consumption and propeller shaft vibration analysis, or can be combined with fuel consumption measurement.

## Your advantage

### Designed for durability and accuracy

The systems have a robust design. They are built to withstand the typical harsh environmental conditions in ships, engine rooms, dredgers, steelworks and heavy industries. Innovative optical sensor technology guarantees high accuracy with an overall error of less than 0,5% F.S.D.

### No maintenance required

T-Sense torque measuring systems are maintenance-free as a result of noncontact power and signal transmission. They are designed to work continuously. No recalibration is needed, because signals are stable during its lifetime.

### Easy installation and commissioning

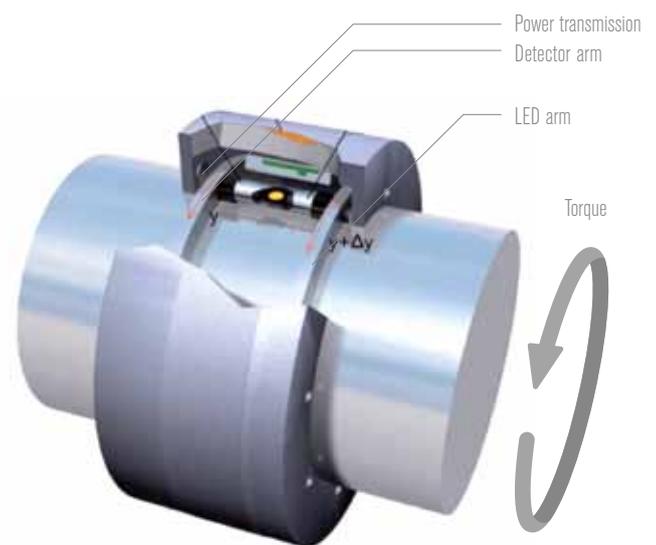
The intelligent design enables installation by customers staff.

# Principle of operation

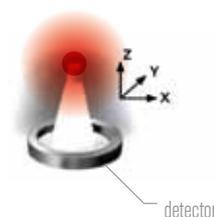
The T-Sense measuring system can be mounted on propeller or drive shafts. When a shaft is subject to torque this will result in a small strain at the shaft surface. A LED and an extremely accurate optical cell can detect these small movements of the surface. The measured values are transferred continuously from the rotating shaft to the stator part through a 2.4 GHz wireless data connection. Power transmission from the stator to the rotating shaft is performed by means of induction.

The stator part consists of a bracket, a power transmission coil, a data signal receiver and a control box equipped with digital and analogue output connections. These outputs can be linked directly to the vessels data network, monitoring or control system.

The stator part can optionally be connected to a Propulsion Efficiency Monitor (PEM2), which displays shaft power, torque and speed.

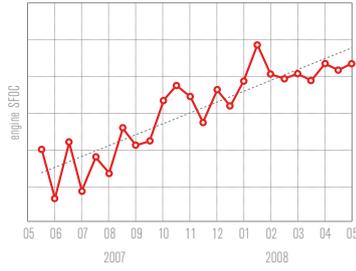
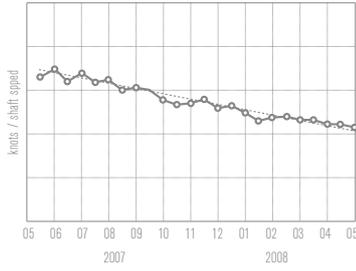


$\Delta y$  is a small movement of the propeller shaft surface due to strain  
Measuring principle



Optical displacement measurement

# Typical system arrangement



Efficiency monitor

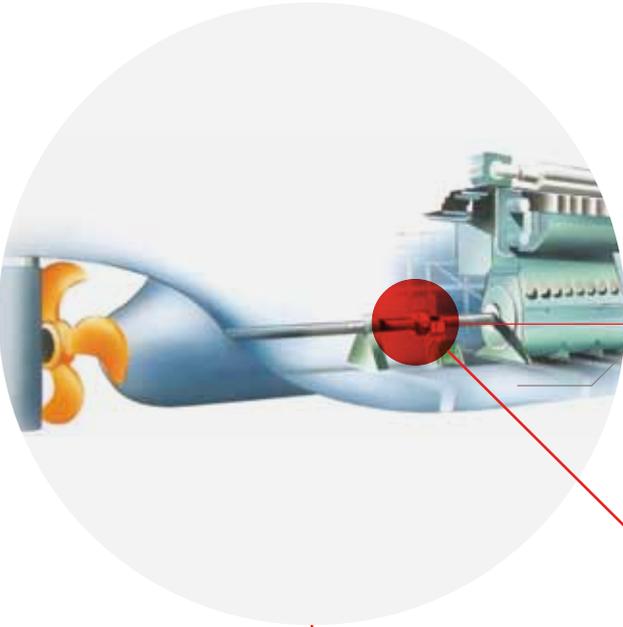
- Trip reports
- Cumulative values
- Data storage



Fault detection



8x PT2 flow meter  
(flow + temp)  
for max. 4 consumers



Typical T-Sense torque measuring system with optional energy consumption and outputs

# Features & benefits

VAF Instruments has developed the new T-Sense torque measuring system with modern and user-friendly electronics, based on proven very accurate optical sensor technology. The standard T-Sense torque measuring system will be delivered with an interface box for easy connection to the ships data network, monitoring or control system. The PEM2 with a touch screen display, can be supplied as a monitoring system.

Features	Benefits
Optical measuring principle	No time consuming mounting of strain gauges
	High accuracy and repeatability
	Detection of torsional vibrations
Extreme accuracy of optical sensor (within nanometer range)	Very accurate output signals resulting in high measuring accuracy and repeatability
	Torsional vibration analysis is possible during long interval period
Wireless transmission of data and power	No maintenance
	No wear
Digital output signal available	Easy and accurate digital data transfer to the vessels network, monitoring or control system
	Only 1 communication cable to the bridge
	User friendly installation
Easy installation and commissioning without assistance	Low overall installation costs
	No engineering or commissioning assistance needed
Calibrated for life	No need for recalibration
	No servicing costs
	Low costs of ownership
A genuine VAF Instruments product	Over 70 years of experience in sensor technology for maritime applications
Manufactured by a ISO 9001 certified organization	Assured constant product quality
Touch screen display	No operator training required
	User friendly human interface

# Technical specification

## T-Sense torque measuring system

Control box at stator part	
Power supply	115 or 230 VAC, 50 or 60 Hz +/- 20%
Power consumption	40 VA maximum
Input	2.4 GHz fully protected encrypted signal
Output	Ethernet, RS 485 for MODBUS protocol or 4-20 mA isolated current output (optional)
Dimensions	408 x 360 x 111 mm
Rotor equipment	
Material of mounting rings	carbon steel
Material outside cover	polyurea coated high density foam
Material compensator arms	carbon steel
Shaft speed detection	accelerometer signal
Output	2.4 GHz fully protected encrypted signal
Dimensions	depending on shaft diameter
Operating temperature	-10°C to 60°C
Measuring tolerance	< 0.5% F.S.D.
Optional Propulsion Efficiency Monitor (PEM2)	
Supply	24 VDC
Display	touch screen, 320 x 240 pixels
Operating temperature	0°C to 55°C
Dimensions	186 x 145 x 45 mm
Front panel protection	IP65/NEMA4
Input	MODBUS for torque, speed and power
Optional input	fuel consumption, pulses from flow meter and temperature via integrated temperature sensor PT100 <sup>1</sup> speed log as pulse input or GPS (NMEA) signal 4-20 mA current input for generator power serial input for additional data
Output <sup>2</sup>	relays for alarms, high/low torque levels
Notes: <sup>1</sup> Refer to Product Bulletin 135 for MidFlow® Model PT <sup>2</sup> For other output options consult VAF Instruments	



# Options and accessoires

## Propulsion Efficiency Monitor (PEM2)

The PEM2 instantly displays torque, speed, shaft power and other selected measuring data. Additional flow meter signals and temperature sensor (PT100) signals enable calculation of the engines fuel consumption with optional temperature compensation.

In combination with input signals from speedlog or GPS, the PEM2 will calculate the temperature corrected fuel consumption per kW or per nautical mile.

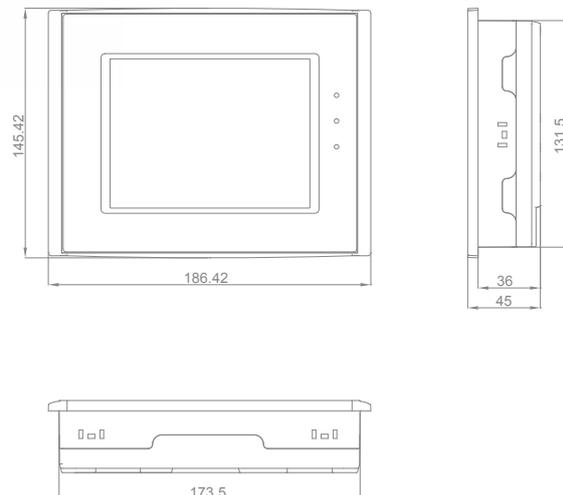
### Features:

- Touch screen display;
- Easy menu structure;
- Display of figures and bar graphs;
- User friendly, log functions for alarms and instant detection of missing signals.

### Optional:

- Display of fuel consumption per kW;
- Display of fuel consumption per nautical mile.

The PEM2 helps the ships crew and the owner to find the best settings for engine, trim and propeller pitch, as the effect of the changes will be instantly displayed.



Dimensions PEM2 touch screen

# Applications

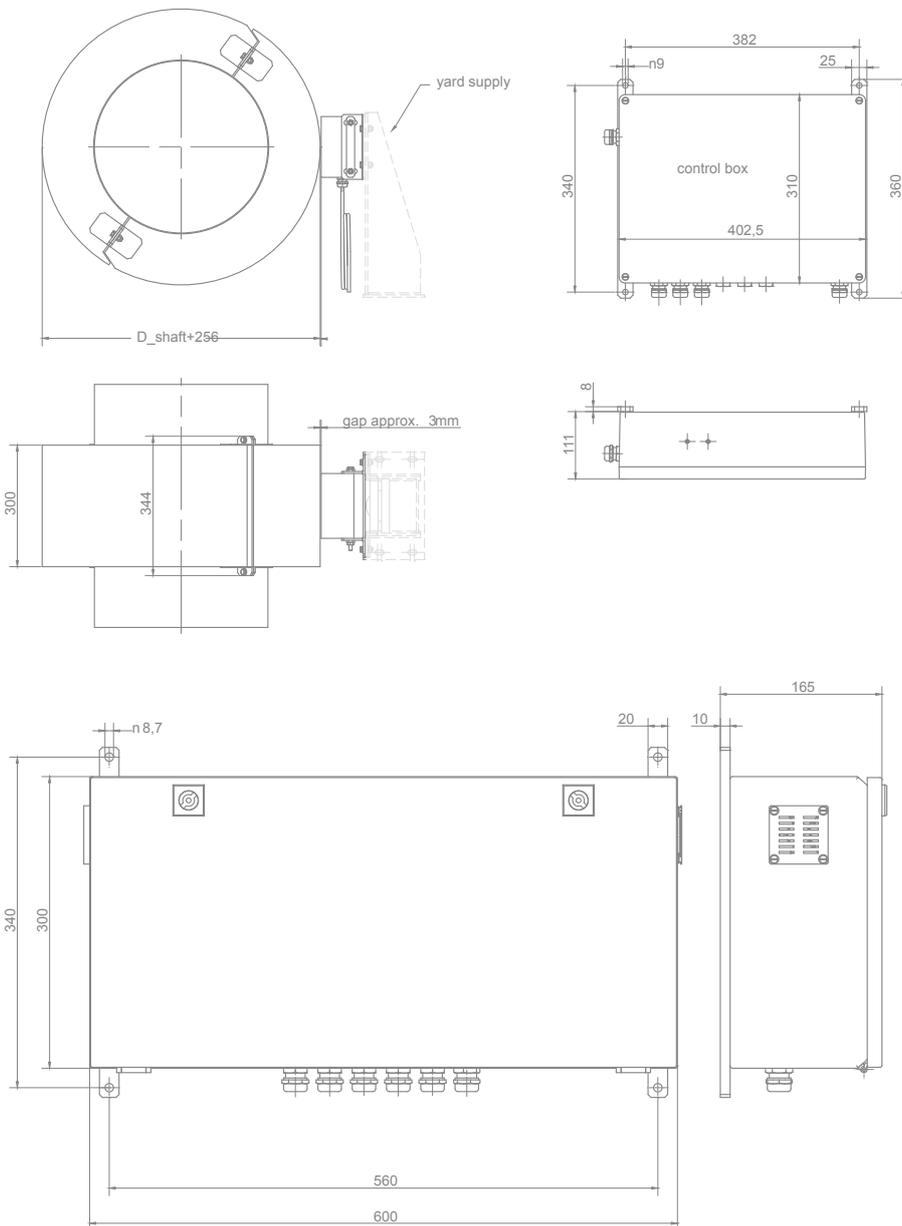
In combination with a PEM2 or with the vessels monitoring system, the T-Sense measuring system can be used in a variety of applications such as:

- Continuous power output measurements for ship propulsion;
- Continuous power and consumption management including specific fuel oil consumption;
- Direct visual control of changes in engine setting, trim and draught;
- Continuous and long term monitoring of torque, speed and power;
- Torsional vibration analysis for frequencies up to 50 Hz.

Besides these standard applications VAF Instruments also manufactures special designs:

- Test bed shafts;
- Tailor-made software.

# Dimensions



T-Sense rotor and control box

Optional PEM2 Signal Processing Unit

### Quotation & ordering information

1. Number of units per ship:			
2. Ships name / hull:			
3. Available shaft length [mm]:			
4. Please provide shaft line drawing for installation:			
<input type="radio"/> new building		<input type="radio"/> retrofitting	
5. Design conditions:			
power [kW]:			
speed [rpm]:			
shaft material:		shear modulus G [N/mm <sup>2</sup> ]:	
shaft diameter (+tolerance) [mm]:			
inside diameter [mm]:			
application		<input type="radio"/> propeller shaft	<input type="radio"/> dredge pump
		<input type="radio"/> jet pump	<input type="radio"/> other:
6. System:			
required output	torque	<input type="radio"/> range 4 - 20 mA =	- kNm
		<input type="radio"/> RS 485/MODBUS	
speed		<input type="radio"/> range 4 - 20 mA =	- rpm
		<input type="radio"/> RS 485/MODBUS	
power		<input type="radio"/> range 4 - 20 mA =	- kW
		<input type="radio"/> RS 485/MODBUS	
		<input type="radio"/> other:	
options	<input type="radio"/> touch screen display for torque, shaft speed and power read-out		
	<input type="radio"/> trip levels on torque		
	<input type="radio"/> energy consumption		
	<input type="radio"/> total power calculation for twin screw vessels		
	<input type="radio"/> torsional vibration analysis		

Name:

Place and date:

For further information see relevant Product Bulletins or [www.vaf.nl](http://www.vaf.nl)

Represented by

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